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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/670,216	09/26/2003	Kenchi Ito	520.43160X00	6838
20457	7590	09/22/2004		
ANTONELLI, TERRY, STOUT & KRAUS, LLP 1300 NORTH SEVENTEENTH STREET SUITE 1800 ARLINGTON, VA 22209-9889			EXAMINER HO, TU TU V	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 09/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/670,216	Applicant(s) ITO ET AL.	
	Examiner Tu-Tu Ho	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) 11 and 12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) 3 is/are allowed.
- 6) ☒ Claim(s) 1,2,5 and 7-10 is/are rejected.
- 7) ☒ Claim(s) 4 and 6 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on 09/26/2003 is acceptable.

Election/ Restriction

2. Applicant's election without traverse of Group I, claims 1-10, in Paper filed 09/07/2004 is acknowledged. The requirement is still deemed proper and is made FINAL, and claims 11-12 are withdrawn from consideration.

Information Disclosure Statement

3. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper (i.e., Form PTO-1449)." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

- (e) the invention was described in
 - (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. **Claim 2** is rejected under 35 U.S.C. 102(e) as being anticipated by Den et al. U.S. Patent Application Publication 2003/0001274.

Den discloses a patterned magnetic recording medium in which pillar-like nanostructures (42, Fig. 9B) each comprising a multilayered film (“laminated”) showing a tunneling magnetoresistance effect or a multilayered film showing a giant magnetoresistance effect (GMR, paragraph [0093]) are surrounded by insulators (15) in such a way as to be laid out apart from one another at substantially even pitches (Fig. 3A and paragraph [0087]) and are provided on a conductive electrode layer (12, paragraph [0049]) formed on a substrate (11).

5. **Claim 2** is rejected under 35 U.S.C. 102(e) as being anticipated by Tuominen et al. U.S. Patent Application Publication 2002/0158342 (hereinafter referred to as the ‘342 publication).

The ‘342 publication discloses a patterned magnetic recording medium in which pillar-like nanostructures (paragraphs [0007], [0009], and paragraphs [0111] through [0120]) each comprising a multilayered film (paragraph [0009]: “cylinders can also include alternating layers of magnetic and non-magnetic material, whether the layers alternate substantially regularly along the length of the cylinders or not”) showing a tunneling magnetoresistance effect or a multilayered film showing a giant magnetoresistance effect (paragraph [0009]) are surrounded by insulators (“copolymer matrix component”, Fig. 1, and paragraph [0083]) in such a way as to be laid out apart from one another at substantially even pitches (paragraph [0014]) and are

provided on a conductive electrode layer (for example, Fig. 4) formed on a substrate (“substrate”).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. **Claims 5 and 7** are rejected under 35 U.S.C. §103(a) as being unpatentable over the ‘342 publication for being obvious.

The ‘342 publication discloses a patterned magnetic recording medium as detailed above including pillar-like nanostructures each comprising a multilayered film showing a tunneling magnetoresistance (TMR) effect or a multilayered film showing a giant magnetoresistance (GMR) effect, and although not explicitly disclosed, each of the multilayered film comprising two magnetic films sandwiching a nonmagnetic film, the nonmagnetic film comprising a nonmagnetic tunneling insulation film (TMR) or a nonmagnetic metal film (GMR), as is defined in the art.

However, the ‘342 publication fails to disclose that one of the two magnetic films of the multilayered film is a free magnetic film and the other is a fixed magnetic film whose magnetic direction is pinned or fixed by an anti-ferromagnetic film as claimed.

Nevertheless, the technique of fixing the magnetic direction of the fixed magnetic film in one direction using an anti-ferromagnetic (AF) film is known in the art to ensure that the change

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in resistance is greatest (the magnetoresistance is greatest when the magnetic direction of the free magnetic film, whose magnetic direction is free to change, is antiparallel to the magnetic direction of the fixed magnetic film whose magnetic direction as stated should be kept fixed using the AF film) when the multilayered film constituting the recording medium is read or written. See, for example, Gupta et al. U.S. Patent 6,034,887, column 1, lines 45-60. Since the limitations are known in the art, the change of the device of the '342 publication to incorporate the limitations would have been obvious at the time the invention was made and would not constitute patentability.

7. **Claims 1 and 8-10** are rejected under 35 U.S.C. §103(a) as being unpatentable over the '342 publication in view of Dietzel et al. U.S. Patent 6,665,258 (the '258 patent).

The '342 publication discloses a magnetic memory apparatus comprising a patterned magnetic recording medium including nanostructures for memory storage as detailed above, but fails to disclose a means for recording and reading the contents of the magnetic recording medium.

In particular, the '342 publication fails to disclose a cantilever array in which cantilevers having conductive chips at distal ends are laid out in an array and apart from one another in such a way as to be associated with the nanostructures, whereby information is written or read by a current supplied from that one of the conductive chips which is associated with a desired one of the nanostructures as that conductive chip is put in contact with the desired nanostructure.

The '258 patent, in disclosing a method for recording, storing, and reproducing information for nanoscale magnetic recording media (column 1, lines 52-65), teaches an array of

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cantilevers (column 4, lines 43-67) for improving reading and writing the memory contents of the recording medium (“improves scanning probe”, column 3, lines 5-8) by supplying a current path through the recording medium during the writing and reading (column 3, lines 13-18).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of the ‘342 publication such that it includes an array of cantilevers as taught by the ‘258 patent for reading and writing the memory contents of the recording medium. One would have been motivated to make such a modification in view of the teachings of the ‘258 patent that such an array of cantilevers improves reading and writing.

Note also that in the art of forming and using magnetic recording media comprising TMR or GMR, insofar as writing and reading information using an electrical current path through recording media, just as detailed above, are concerned, limitations such as *wiring* information by *inverting* magnetization using an electrical current and reading information by causing an electrical current whose value is smaller than that of a current by which magnetization is *inverted* are inherent.

Allowable Subject Matter

8. Claim 3 is allowable over the prior art of record.

Claims 4 and 6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner’s statement of reasons for the indication of allowable subject matter: The cited art, whether taken singularly or in combination, especially when all

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limitations are considered within the claimed specific combination, fails to teach or render obvious a patterned magnetic recording medium having all exclusive limitations as recited in claims 2/4 (claims 2 and 4) and claim 3, comprising pillar-like nanostructures each comprising a multilayered film having a lamination of a multilayered film showing a tunneling magnetoresistance effect and a multilayered film showing a giant magnetoresistance effect on a conductive electrode.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Tu-Tu Ho
September 17, 2004